

NASA TECH BRIEF

Goddard Space Flight Center



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Process for the Production of Star-Tracking Reticles

The problem:

A star tracker was required as a component of the guidance system in an unmanned spacecraft. The design incorporated two counter-rotating reticles (Figure 1) that must operate at 2800 to 9000 rpm, without distortion, and withstand the effects of the spacecraft launch environment. Further requirements were that the reticles have a high level of transmission in the ultra-violet and have nonreflective surfaces.

The solution:

Reticles designed with quartz bases are masked with the desired pattern and then are coated with highly adherent layers (Figure 2) of chromium, a chromium silver alloy, silver, copper, and black chromium (a mixture of chromium and chromium oxides). The black chromium final layer (not shown in Figure 2) produces the required nonreflective surface.

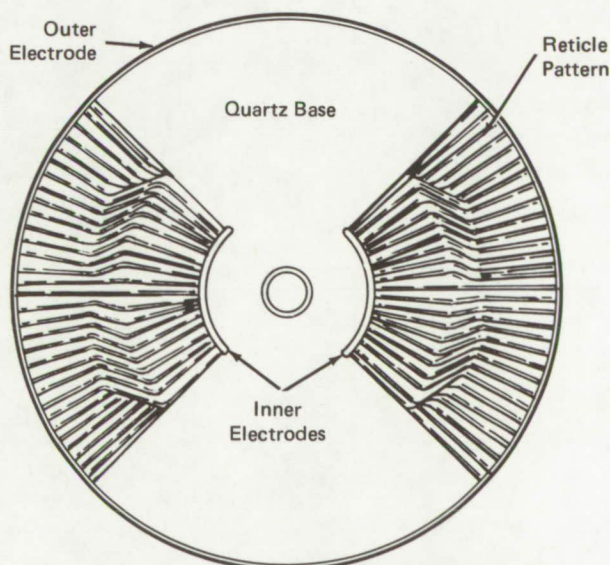


Figure 1. Finished Reticle Configuration

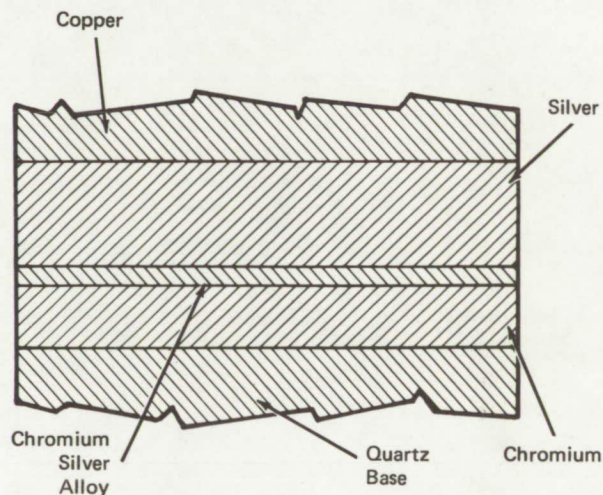


Figure 2. Reticle Segment Construction

How it's done:

To form a reticle, a quartz blank is cut, ground, and polished to obtain the optical properties required for the application. The reticle pattern is then produced in artwork form and is reduced to the size of the quartz blank. A beryllium-copper alloy substrate is fabricated, also to the dimensions of the quartz blank. Using the reticle pattern, a positive-working photoresist is applied to the beryllium-copper substrate, and the uncoated areas are then gold plated. The positive-working photoresist is removed and replaced with a negative-working photoresist, which is developed to expose the base metal of the pattern. The unplated side of the pattern is then chemically etched to produce the mask.

The mask is then used in the vacuum deposition of the layers shown in Figure 2, plus a final layer of electrodeposited black chromium. The final product is as shown in Figure 1. Two of the reticles are used in a star tracker. They are superimposed and operate in counter rotation.

(continued overleaf)

Note:

Requests for further information may be directed to:
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Reference: B73-10488

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,702,808). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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